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*Publication date:*  
2013

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Nielsen, M. E., Jiménez, N. I. V., Przybylska, D. A., Schmidt, J., Hasselbalch Volke Hougaard, C., & Wulff, T. (2013). *Modulation of the tissue regenerative process in fish by  $\beta$ -glucans*. Abstract from World Aquaculture Society: Aquaculture 2013, Nashville, TN, United States.  
<https://www.was.org/wasmeetings/meetings/ShowAbstract.aspx?Id=29605>

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## MODULATION OF THE TISSUE REGENERATIVE PROCESS IN FISH BY $\beta$ -GLUCANS

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Immune modulators are compounds capable of interacting with the immune system and thereby modifying the host response. This interaction enhances non-specific defense mechanisms, improving health and promoting survival.  $\beta$ -glucans are glucose polysaccharides present in sea weed, bacteria, fungi and cereal but not in animals.  $\beta$ -glucans are commonly used as immune modulators, but the mechanisms through which the modulation is achieved remains to be understood. Wound healing and tissue regeneration are essential mechanisms to ensure the survival and health of any organism. Studies from the mammalian systems have shown the importance of fibroblasts, macrophages, reactive oxygen species (especially hydrogen peroxide) and certain cytokines during wound healing processes. In fish however, only a few studies have been devoted tissue regeneration and modulation of cell proliferation during wound healing, even though mechanical injury as well as numerous diseases can severely damage fish tissues. The work presented examines for the first time the immunomodulatory effects of  $\beta$ -glucans during wound healing processes in fish. Experiments have been conducted both *in vivo* and *in vitro* and results clearly show the immunomodulatory effects of  $\beta$ -glucan during the wound healing process. The wound healing process was monitored using image analysis, real time PCR and proteomics.

The study showed that  $\beta$ -glucan treatment enhanced wound closure in fish, probably due to the enhancement of a localized inflammatory response. The modulatory effect of  $\beta$ -glucan on wound healing seems to be orchestrated by the immune system, since as direct effect on fibroblast proliferation were observed. Furthermore, production of ROS may influence the fate of tissue regeneration, and differences in ROS patterns could be one of the possible ways in which fish alert the immune system to drive the immune response towards pathogen eradication or tissue repair.

Figure shows size of wound area following treatment with  $\beta$ -glucans.

